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VIA ELECTRONIC FILING

Document Control Office (7407M)
Office of Pollution Prevention and Toxics (OPPT)
Environmental Protection Agency (EPA)
1200 Pennsylvania Avenue NW
Washington, DC 20460-0001

Re: Comments Supporting Request for Additional Information on Methylene Chloride;
Rulemaking Under TSCA Section 6(a) (Docket ID: EPA-HQ-OPPT-2020-0465)

To Whom It May Concern:

I write on behalf of The Boeing Company (Boeing) to provide comments on Docket Identification Number EPA-HQ-OPPT-2020-0465, Methylene Chloride; Rulemaking under TSCA section 6(a). Boeing welcomes the chance to inform EPA of our uses of methylene chloride so that the Agency may reference this information as it prepares its risk management rulemaking.

Boeing is the world's largest manufacturer of commercial jetliners and defense, space, and security systems. Boeing products and tailored services include commercial and military aircraft, satellites, weapons, electronic and defense systems, launch systems, advanced information and communications systems, and performance-based logistics and training. Boeing employs approximately 150,000 people across the United States, with major manufacturing operations in eight states. As a top exporter, Boeing has customers in more than 150 countries across the world, and supports airlines and U.S. allied government customers in more than 90 countries.

In June 2020, EPA finalized its risk evaluation for methylene chloride and found that it presents an unreasonable risk to human health for 47 out of 53 conditions of use.¹ As the agency prepares to propose risk management rules for methylene chloride and as Boeing continues to review its internal use of methylene chloride and methylene chloride-containing materials to evaluate their importance to our production system and the availability of alternatives, we requested the Agency's assistance in categorizing the condition of use (COU) associated with one of our uses of methylene chloride.

Boeing appreciated the opportunity to meet with the Agency on May 12, 2022 to discuss Boeing's Fuel Test Laboratory, wherein methylene chloride is utilized as a heat transfer fluid. While the focus of this letter is to provide a public comment associated with this use, we would like to remind the Agency that methylene chloride is present in many formulations found within

¹ "Risk Evaluation for Methylene Chloride (Dichloromethane, DCM)." EPA-740-R1-8010, June 2020.
https://www.epa.gov/sites/default/files/2020-06/documents/1_mec1_risk_evaluation_final.pdf

Boeing's manufacturing processes including, but not limited to, paint and coating removers, adhesives, and sealants. As these methylene chloride-containing materials are broadly used within the aerospace industry, it is critical that EPA understand how the development of risk management rules may affect the industry's immediate ability to manufacture and maintain critical aerospace components.

Methylene Chloride Use in Fuel Test Equipment

Boeing would recommend that the Agency conclude that the closed-loop methylene chloride chiller system, responsible for cooling Jet-A fuel and other kerosene-type fluids to temperatures as low as -40°F for FAA required fuel testing, is best categorized as a laboratory use based on the following description.

Installed in North Boeing Field in 1993, this chiller system is comprised of a 10,000-gal tank of methylene chloride, a refrigeration compressor, multiple transfer and circulation pumps, methylene chloride-to-fuel heat exchangers, and associated plumbing. Methylene chloride is cycled through the compressor to cool and returned to the storage tank using a circulation pump. From the storage tank, methylene chloride is directed to a shell and tube heat exchanger using a distribution pump, where it makes indirect contact with the fuel through the tubing walls in the heat exchanger, cooling the fuel to the desired test temperature. Based on review of available records and recollection of current and former employees, we believe the chiller system has not required a full methylene chloride recharge or top-off since its initial installation.

This chiller system was specifically designed to utilize methylene chloride as its viscosity properties allow for adequate pump circulation at low temperatures. Additionally, methylene chloride has the desired heat transfer properties, is non-flammable, and is immiscible with water; making it a superior fluid for this closed system.

The methylene chloride chiller system supports two tests, *cold fuel soaks* and *water in fuel effects*. In cold fuel soak testing, a test article, such as a coupon, pump, or valve, is submerged in fuel chilled for a specified amount of time. Testing in this manner allows Boeing to evaluate the material compatibility of the test article with chilled fuel; thereby demonstrating that the test article meets material performance requirements.

FAA airworthiness standards require that Boeing perform the *water in fuel effects* test; which requires the unique properties of the methylene chloride chiller system.² While briefly described below, full details for this test can be found in SAE ARP1401B, "Aircraft Fuel System and Component Icing Test".³ In this test, fuel is cooled to a temperature as low as -40°F and water is injected directly into the fuel stream. This fuel stream is then circulated through a representative fuel system. At this temperature, ice will build up on the tubing walls and screens of the representative fuel system, which in turn will decrease fuel flow. As ice accumulation in fuel systems is expected, this test is critical to ensuring that the system and its components are not hindered by the presence of ice or the effects of ice as it circulates in the system, as failure during service may result in a flight safety hazard.

² 14 CFR [25.901\(c\)](#), [25.951\(c\)](#), [25.952\(a\)](#), and [25.1301](#).

³ SAE International ARP1401B Aircraft Fuel System and Component Icing Test, 2012.
<https://www.sae.org/standards/content/arp1401b>

In 2012, the Boeing Test & Evaluation Organization studied the feasibility of replacing methylene chloride with a new heat transfer fluid. Approximately 12 heat transfer fluids were initially reviewed and the list was quickly narrowed to 7 potential alternatives. Methylene chloride remained the optimal heat transfer fluid as the study showed that each of the identified alternatives would greatly reduce the heat exchange rate; meaning that the equipment would either take a significant amount of time to cool to the required test temperature or be unable to cool to the required test temperature at all.

Need for an Aerospace Exemption of Methylene Chloride-Containing Paint Strippers

In 2017, EPA solicited comment on its proposed rulemaking under Section 6(a) of the Toxic Substances Control Act (TSCA) to regulate methylene chloride and n-methylpyrrolidone (NMP) in paint and coating removal.⁴ Boeing commends the Agency for recognizing in its proposed rule that there are technical limitations to replacing methylene chloride paint strippers for mission-critical corrosion-sensitive components on military aviation and vessels and its proposal to grant an exemption for those uses for a period of 10 years. The Boeing Company strongly agrees with comments submitted by AIA⁵ requesting that EPA expand the scope of this exemption to include the entirety of the aerospace industry, as the components EPA referenced in the proposal (landing gear, gear boxes, turbine engine parts, components composed of metallic materials, and composite materials) are critical to all aircraft, such as civilian and commercial aircraft and security and space applications, and are required to undergo strenuous testing in order to obtain Federal Aviation Administration (FAA) certification.

As Boeing expects the upcoming risk management proposal for methylene chloride to include regulation of *industrial and commercial use of paint and coating removers*, we are continuing to analyze this COU within our production system to understand the impact of future regulations. We have identified several applications across the Company that require the use of methylene chloride paint and coatings removers which currently have no feasible alternatives. These include:

- Large parts or parts with complex geometries that cannot undergo media blasting or strip tank immersion either due to size constraints or entrapment concerns; and where hand abrasion is impractical
- Situations in which selective coating removal is needed; e.g. the preservation of a conversion coating
- Effective removal of oven-cured paints and coatings
- Localized removal of coatings on overhaul or rework parts to reveal part markings and serial numbers
- Stripping of parts preceding non-destructive testing (NDT), where other coating removal methods such as media blasting could hide defects
- Removal of polyvinyl formal or polyurethane insulating enamel from copper magnet wire⁶

⁴ [82 Fed. Reg. 7464 \(January 19, 2017\)](#).

⁵ Aerospace Industries Association, Comments on Regulation of Certain Uses Under Toxic Substances Control Act: Methylene chloride and N-methylpyrrolidone (May 2017), <https://www.regulations.gov/comment/EPA-HQ-OPPT-2016-0231-0588>

⁶ The Boeing Company understands wire stripping to fall under the “paint and coating removers” COU. It would be helpful for EPA to confirm in the proposed rulemaking.

Boeing has spent many years, and considerable effort qualifying and implementing alternative materials and processes to replace methylene-chloride paint and coating removers with a combination of acid, alkaline, and hydrogen peroxide-activated benzyl alcohol removers and plastic media blast (PMB) where alternatives are technically viable. Boeing continues to evaluate both non-methylene chloride chemical removers and non-chemical solutions to coatings removal as new formulations and technical innovations appear on the market. One example of this is Boeing's exploration of laser ablation to remove paint and coatings from large aerospace components and complete aircraft, which if implemented will eliminate hazardous waste, alleviate ergonomic challenges and save significant time in comparison to traditional paint stripping operations.⁷ As potential alternatives are identified, they will need to undergo rigorous testing before they can be approved for use to ensure that they will not degrade the airworthiness of the aircraft. Implementing an alternative for each of the applications listed above will require time and, in the case of non-chemical solutions, potentially substantial investment.

Need for de Minimis levels in Methylene Chloride use that is incorporated into a formulation or mixture

There are a few instances in which the Company is still reliant on specification qualified materials that contain trace amounts of methylene chloride, such as application-specific adhesives, sealants, and polycarbonate materials. While our known use is limited to a small number of materials, they are utilized throughout Boeing's production system. Boeing believes the presence of trace amounts of methylene chloride in these formulations is likely a raw material supply issue rather than a functional requirement in contrast to materials containing higher percentages of methylene chloride. As formulators may deem the amount of methylene chloride in their products proprietary, it may be difficult for the Company to determine full dependence on this chemical.

Boeing respectfully requests that if EPA looks to regulate the use of formulations or mixtures that contain methylene chloride the Agency include a de minimis concentration of 0.5% to account for raw material supply concerns and provide a 10-year exemption for the reformulation of materials used by the aerospace industry that contain larger concentrations of methylene chloride. This longer re-formulation window is needed as specification qualified materials have undergone thorough testing to ensure that they meet necessary performance criteria and any alternative would require the same qualification process. This can be a time consuming and costly activity; which can take multiple years to complete as it includes qualification testing, certification, and implementation as illustrated by the Technology Readiness Level (TRL) scale.⁸ Furthermore, immediate success in finding an alternative cannot be guaranteed, and if the selected alternative is found unsuitable, the process must begin again.

⁷ Gregersen, Kady. 2021. "A light solution to a gritty issue." *Innovation Quarterly*. 5. no. 16.
<https://www.boeing.com/features/innovation-quarterly/2021/03/laser-ablation.page>

⁸ Yu, Jeanne C., Richard A. Wahls, Barbara M. Esker, Laurette T. Lahey, David G. Akiyama, Michael L. Drake, and Doug P. Christensen. "Total Technology Readiness Level: Accelerating Technology Readiness for Aircraft Design." In *AIAA AVIATION 2021 FORUM*, p. 2454. 2021.
<https://ntrs.nasa.gov/api/citations/20210015639/downloads/AIAA%20Total%20Technology%20Readiness%20Level%20Paper%20Final.docx.pdf>

Boeing appreciates this opportunity to provide additional input to EPA to inform the risk management rules for methylene chloride. We respectfully request that EPA provide the aerospace industry with a ten-year exemption to allow continued use of methylene chloride in paints and coatings removers, a de minimis level of 0.5% for methylene chloride incorporated into formulations or mixtures, and a ten-year exemption for materials that incorporate methylene chloride into formulations or mixtures above our recommended de minimis level. These recommendations will allow the aerospace industry to meet DoD and FAA specifications and ensure safety of flight as well as provide adequate time for material qualification. Please do not hesitate to contact me, or Peter Pagano, at (703) 414-6486 should you have any questions.

Sincerely,

A handwritten signature in blue ink, reading "Steve Shestak", followed by a long horizontal line extending to the right.

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